

RASCH MODEL TO ANALYZE THE ENVIRONMENTAL ATTITUDE AMONG PRE-SERVICE BIOLOGY TEACHERS

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ABSTRACT

Environmental attitude is preference to positive (favorable) or negative (unfavorable) respond toward the environment and lead people to take environmentally friendly behavior. The attitude shapes people intention in action toward the environment such as participation on conservation, saving energy, waste recycling, green consumption, or innovative action to prove environmental problems. The purpose of the study is to investigate the preservice biology teacher's preference toward the environment. Respondent consisted of 65 of preservice biology teacher at first year. The research was quantitative method and used questionnaire which is adapted from New Ecological Paradigm Scale. The data was analyzed from item-person map, item measure, item fit order, person measure, person fit order and scalogram to find the respond pattern. The result reveal that the environmental attitude of preservice biology teacher is inconsistent.

Keywords: *environmental attitude, environmentally friendly behavior, New Ecological Paradigm Scale*

INTRODUCTION

Environmental problem needs real action from citizens, scientist, student, and government (Wei, Burnside, & Che-Castaldo, 2015). Environmental problems become people interests around the world, however not all people are engaged on real efforts to solve the problems. It means individual action to mitigate the environmental problem is very important to minimize the environmental impact (Liobikiene & Juknys, 2016). There is a gap between attitude and behavior. According to the Theory of Reasoned Action, attitude is the predictor of individual' behavior and generated from knowledge and beliefs. The lack of norms, laws and infrastructure are several factors which inhibit individual to act environmentally friendly behavior (Romero, Laroche, Aurup, & Ferraz, 2018).

The positive attitude towards environment grows from the integrated curriculum as the environment is multi-dimensions of biotic, abiotic and culture (Major, Namestovski, Horák, Bagány, & Krekić, 2017). Education has a contribution in order to reach sustainable development goals through the instruction that emphasize authentic investigation of environmental crisis and its problem solving (Kalsoom & Khanam, 2017). Higher education for example could be a partner to develop the mitigation of climate change (Filho et al., 2018). Student or undergraduate student need to understand comprehensively about the process happened in nature and the relationship of causal effect that make the current condition of our environment (Ozsoy, Ertepinar, & Saglam, 2012). Field study promote student to get the real experience about how the beautiful and rich the nature, how people interact to the nature, and what the impact to the environment then initiate their awareness to protect their local environment (Bodzin, 2016). Environmental education has a

challenge to change the individuals' behavior, lifestyles and environmental knowledge into sustainability (Akman & Alagoz, 2017; Vicente-Molina, Fernández-Sáinz, & Izagirre-Olaizola, 2013).

Several studies analyze the relationship between attitude and knowledge, attitude and behavior, and knowledge and behavior (Paço & Lavrador, 2017). However, the empirical study explain that positive environmental values and environmental knowledge drive citizens to positive attitude and behavior towards energy use and saving (Pothitou, Hanna, & Chalvatzis, 2016). Moreover, green consumption behavior are generated from attitude towards ecolabels or green products (Cerri, Testa, & Rizzi, 2018). The same study reveals that environmental behavior positively influenced by environmental attitude, awareness, value, public information, skills and responsibility (Zareie & Navimipour, 2016).

LITERATURE REVIEW

Environmental attitude has significantly influence of environmental behavior (Zareie & Navimipour, 2016). As the research of Liobikiene & Juknys (2016), attitude is a predictor of environmentally-friendly behavior in psychosocial construct. In addition, environmental attitude play a moderating role of people's past pro-environmental behavior on their subsequent actions (Gholamzadehmir, Sparks, & Farsides, 2019). The value determines people judgement of their surrounding environment. According to value-attitude-behavior approach, environmental attitude play a mediating effect between biosphere value and behavioral intentions (Ho, Moon, Eun, & Severt, 2017). In other word, attitude toward the environment to be reinforcement to people intention to act specifically (Halkos & Matsiori, 2017). Another research reveals that environmental attitude is psychological factor of low carbon behavior (Mei, Wai, & Ahamad, 2017). Environmental education has an impact towards student attitude through stimulating student with environmental issues (Zsóka, Szerényi, Széchy, & Kocsis, 2013). However, there is a gap between attitude and behavior (Carrington, Neville, & Whitwell, 2014) because the difficulty to change the habitual.

Growing the environmental attitude take place in various activity and need a stimulation for long time series (Coelho, Pereira, Cruz, Simões, & Barata, 2017). The recent study presents the environmental attitude inventory. There is twelve core dimensions forming the horizontal score that are enjoyment of nature, support for interventionist conservation policies, environmental movement activism, conservation motivated by anthropocentric concern, confidence in science and technology, environmental fragility, altering nature, personal conservation behavior, human dominance over nature, human utilization of nature, eco-centric concern, and support for population growth policies (Milfont & Duckitt, 2010).

According to New Ecological Paradigm scale revised, there is balancing between pro- and cons-NEP statements. There are five dimension to measure ecological worldview, that is the reality of limits to growth, anti-anthropocentrism, the fragility nature balance, rejection of exemptionalism, and the possibility of an eco-crisis (Dunlap, Van Liere, Mertig, & Jones, 2000). The revised scale is more comprehensive and have internal consistency than the original version.

Environmental knowledge has positively correlation towards environmental attitude. The outdoor activity to enjoy or experience the nature has positive relation to environmental attitude. For example, having and carrying pet such as cat or dog give the real experience about extinction, direct interaction to the nature such as gardening practices lead to restore the environmental balance and biodiversity of insect, plant and other organisms (Colléony, White, & Shwartz, 2019). Another study that emphasize the research to the knowledge-attitude-behavior theory present the

people understanding about environmental issues such as the impact of aviation towards carbon footprint increase the people awareness in changing the travel behavior (Lu & Wang, 2018).

The research contributes to the literature in two ways. First, the findings have crucial information about the preference of pre-service biology teacher towards the environment using the revised NEP scale. Second, our conclusion contributes to developing instruction to investigate the relation of pre-service teacher knowledge about the environmental issues and environmental attitude.

METHODS

The research aims to analyze the respond pattern of environmental attitude of preservice biology teacher and analyze the item of questionnaire. The research uses quantitative method. Data collecting about environmental attitude use the adapted New Ecological Paradigm Scale (Dunlap et al., 2000). Technic of sampling use purposive sampling because it is related to the specific subject and problem within Design-Based Research. There are 65 respondents of pre-service biology teachers. Pre-service biology teachers answer the questionnaire of New Ecological Paradigm. There are 15 items that is grouped into five facets. Balance consists of 3 items (S3, S8, and S13). Limits spreads into S1, S6, S11. Item of S5, S10, and S15 includes of eco-crisis. Anti-exempt consists of S4, S9, and S14. Antianthropocentrism consists of S2, S7 and S12. Data analyzing uses MINISTEP software to examine person and item reliability, person and item separation index.

RESULT AND DISCUSSION

Based on the Wright map (Figure 1) known on the left side, there are two person who have a very positive attitude towards the environment. The logit score of the student is more than +2 logit (2.2). These two people are exactly at two standard deviations. Preservice teacher who have a very negative attitude to the environment that is 59 with a logit person value of 0.0. The student is outside the T limit or two standard deviations and can be called an outlier.

When compared to the distance between the M-S-T (mean-standard deviation-two standard deviation) on the Wright map, it can be seen that the distribution of student attitudes (left) is smaller than the level of distribution of agreed items (right). Referring to the level of item difficulty, this shows that the items diversity is far adrift. Meanwhile, from the students' attitudes it can be seen that the distance of their attitudes or abilities is very close. This shows that the tendency of 65 students' attitudes toward the environment is almost the same. When comparing the average logit person and logit item values, it appears that the logit person is greater (1.31). This shows that the overall ability of students is much higher than the level of item difficulty.

On the right of Wright map explains about the distribution of the value of logit items. Item S11 as the item with the highest level of approval and was chosen by almost half the respondents (30 students). This means that the item was approved by most students. Students strongly agree if the earth has limitations in supporting human life. Items S12 and S5 have the same logit value and show the same level of difficulty. The item S6 has the lowest logit value which is -3 logit. This shows that almost all students can answer the item correctly. Almost all students strongly disagree if the resources on earth do not have limitations.

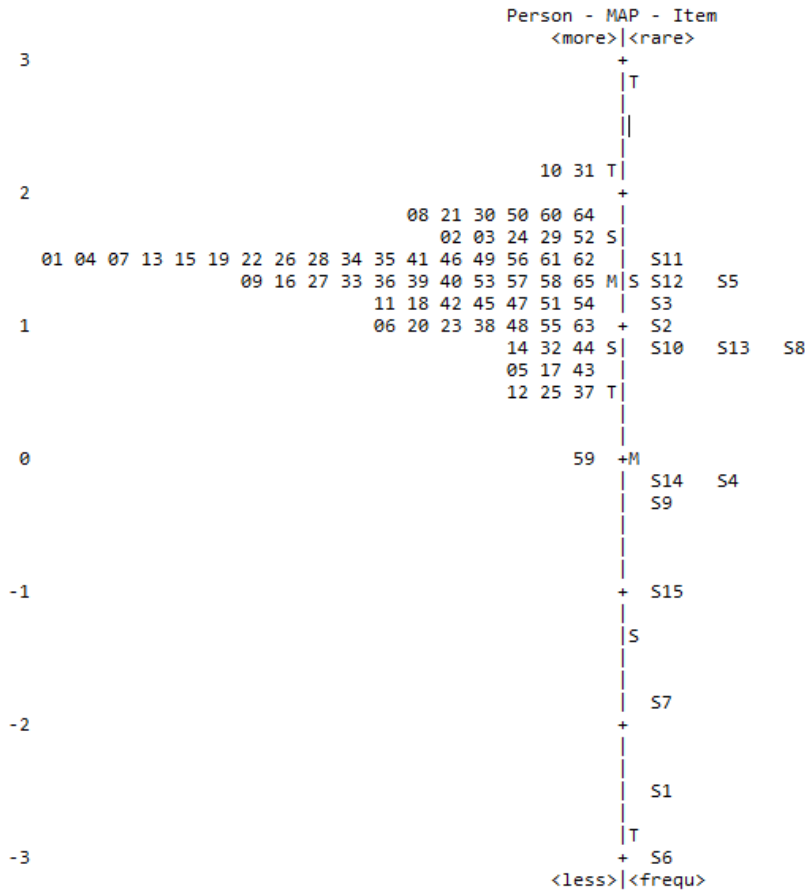


Figure 1. Item-Person Map

To find out the quality of items, it can be seen from Item Measure as shown at Figure 2. In the total count column, there are numbers 63, 64 and 65. Number 65 means all students answer or select items such as item S11. The other items indicate two missing data (63) or one missing data (64). The table ranks the levels that were strongly agreed (S11) to strongly disapproved (S6) by the respondents. It is indicated in the measure column. Information about the difficulty level of items can make it easier for us to identify questions that are strongly agreed and not approved.

Item STATISTICS: MEASURE ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	TOTAL MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT OBS%	MATCH EXP%	Item
11	199	65	1.51	.14	.74	-1.7	.74	-1.7	.55	.35	47.7	39.9	S11
12	205	65	1.40	.14	.98	.0	1.01	.1	.40	.35	38.5	41.1	S12
5	202	64	1.40	.14	.75	-1.5	.77	-1.4	.29	.35	50.0	41.1	S5
3	212	64	1.18	.15	1.28	1.5	1.29	1.5	.38	.34	50.0	42.9	S3
2	224	65	.99	.15	1.06	.4	1.08	.5	.18	.33	41.5	45.7	S2
13	231	65	.82	.16	1.18	1.0	1.16	.9	.45	.32	44.6	48.9	S13
10	224	63	.82	.16	.75	-1.4	.75	-1.3	.51	.32	58.7	48.9	S10
8	233	65	.77	.16	1.46	2.2	1.51	2.3	.14	.32	43.1	50.6	S8
4	263	65	-.11	.18	1.39	1.9	1.42	2.0	.10	.27	60.0	57.6	S4
14	265	65	-.18	.19	.46	-3.5	.45	-3.6	.16	.27	78.5	57.3	S14
9	271	65	-.39	.19	.55	-2.8	.56	-2.8	.36	.26	73.8	56.4	S9
15	285	65	-.94	.21	1.09	.6	1.06	.4	.43	.24	58.5	52.8	S15
7	302	65	-1.79	.24	1.14	.8	1.15	.8	.09	.21	63.1	66.4	S7
1	312	65	-2.53	.30	.96	-.1	1.04	.2	.07	.17	80.0	80.4	S1
6	316	65	-2.96	.35	1.01	.1	1.11	.4	-.01	.15	86.2	86.3	S6
MEAN	249.6	64.7	.00	.19	.99	-.2	1.01	-.1			58.3	54.4	
S.D.	39.4	.6	1.41	.06	.28	1.6	.29	1.7			14.8	13.4	

Figure 2. Item Measure

To find out the level of appropriateness of the items (item fit) which means that in accordance with the measurement model can be seen in Item Fit Order (Figure 3). It can be seen that all items are good for measuring attitudes towards the environment as indicated by Outfit mean square ($0.5 < MNSQ < 1.5$). Item S14 has an MNSQ value < 0.5 which indicates less productive items but does not reduce quality. Likewise, with point S8 has an MNSQ value of 1.51 which means it is not good enough to be used as an instrument. However, the Outfit Z-standard shows that the data do not fit the model because there are data that are too predictable (≤ -2), namely items S14 and S9 and there are also data that seem unpredictable namely item S8 (> 2.0). In addition, the point measure correlation shows that there are 11 items with a value of less than 0.4. The value should range between 0.4 - 0.85.

Item STATISTICS: MISFIT ORDER

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	TOTAL MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT OBS%	MATCH EXP%	Item
8	233	65	.77	.16	1.46	2.2	1.51	2.3	A .14	.32	43.1	50.6	S8
4	263	65	-.11	.18	1.39	1.9	1.42	2.0	B .10	.27	60.0	57.6	S4
3	212	64	1.18	.15	1.28	1.5	1.29	1.5	C .38	.34	50.0	42.9	S3
13	231	65	.82	.16	1.18	1.0	1.16	.9	D .45	.32	44.6	48.9	S13
7	302	65	-1.79	.24	1.14	.8	1.15	.8	E .09	.21	63.1	66.4	S7
6	316	65	-2.96	.35	1.01	.1	1.11	.4	F -.01	.15	86.2	86.3	S6
15	285	65	-.94	.21	1.09	.6	1.06	.4	G .43	.24	58.5	52.8	S15
2	224	65	.99	.15	1.06	.4	1.08	.5	H .18	.33	41.5	45.7	S2
1	312	65	-2.53	.30	.96	-.1	1.04	.2	g .07	.17	80.0	80.4	S1
12	205	65	1.40	.14	.98	.0	1.01	.1	f .40	.35	38.5	41.1	S12
5	202	64	1.40	.14	.75	-1.5	.77	-1.4	e .29	.35	50.0	41.1	S5
10	224	63	.82	.16	.75	-1.4	.75	-1.3	d .51	.32	58.7	48.9	S10
11	199	65	1.51	.14	.74	-1.7	.74	-1.7	c .55	.35	47.7	39.9	S11
9	271	65	-.39	.19	.55	-2.8	.56	-2.8	b .36	.26	73.8	56.4	S9
14	265	65	-.18	.19	.46	-3.5	.45	-3.6	a .16	.27	78.5	57.3	S14
MEAN	249.6	64.7	.00	.19	.99	-.2	1.01	-.1			58.3	54.4	
S.D.	39.4	.6	1.41	.06	.28	1.6	.29	1.7			14.8	13.4	

Figure 3. Item Fit Order

The tendency of students to the environment can be seen from Pearson Measure. The table shows students with very positive to very negative attitudes. In the table, students 10 and 31 have a very positive attitude towards the environment (measure = 2.22) and students who have the most negative attitude are number 59 (measure = 0.05). For more details about which students have the most positive attitude towards the environment even though the value of the logit is the same, it can be seen through the scalogram. In addition, a scalogram can also detect students who do not have a mismatch of response patterns with the ideal model. Person Fit Order table will appear sequentially students who have the criteria do not fit at the top. Based on the table, there were 12 students who did not meet the criteria, namely the Outfit MNSQ is more than 1.5.

Overall instrument analysis can be shown by Summary Statistics (Figure 5). The Pearson measure of 1.31 logit indicates the average value of all students in answering items on the questionnaire. The average value that is greater than the logit value of 0.0 indicates a tendency for students' abilities to be greater than the level of item difficulty. In the aspect of Pearson reliability is only 0.04. This shows that the consistency of student answers is weak. However, from the aspect of item reliability amounted to 0.98. This value represents that the reliability of items is excellent because more than 0.94. The Cronbach alpha index of only 0.27 shows that the interaction between person and item as a whole is very poor. To find out the sensitivity of the response pattern to the target items in the respondent can be seen in the Infit MNSQ. Meanwhile, to measure the sensitivity of response patterns to items with a certain level of difficulty than the respondent (person) using Outfit MNSQ.

SUMMARY OF 65 MEASURED Person

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT		OUTFIT	
					MNSQ	ZSTD	MNSQ	ZSTD
MEAN	57.6	14.9	1.31	.36	.99	-.2	1.01	-.1
S.D.	3.4	.2	.41	.03	.66	1.5	.62	1.4
MAX.	64.0	15.0	2.22	.43	3.88	4.6	3.63	4.4
MIN.	46.0	14.0	.05	.31	.16	-3.2	.19	-3.1
REAL RMSE	.40	TRUE SD	.08	SEPARATION	.19	Person	RELIABILITY	.04
MODEL RMSE	.36	TRUE SD	.19	SEPARATION	.53	Person	RELIABILITY	.22
S.E. OF Person MEAN = .05								

Person RAW SCORE-TO-MEASURE CORRELATION = .97
CRONBACH ALPHA (KR-20) Person RAW SCORE "TEST" RELIABILITY = .27

SUMMARY OF 15 MEASURED Item

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT		OUTFIT	
					MNSQ	ZSTD	MNSQ	ZSTD
MEAN	249.6	64.7	.00	.19	.99	-.2	1.01	-.1
S.D.	39.4	.6	1.41	.06	.28	1.6	.29	1.7
MAX.	316.0	65.0	1.51	.35	1.46	2.2	1.51	2.3
MIN.	199.0	63.0	-2.96	.14	.46	-3.5	.45	-3.6
REAL RMSE	.21	TRUE SD	1.40	SEPARATION	6.68	Item	RELIABILITY	.98
MODEL RMSE	.20	TRUE SD	1.40	SEPARATION	6.96	Item	RELIABILITY	.98
S.E. OF Item MEAN = .38								

Figure 5. Summary Statistic

In the person table, the values show respectively 0.99 and 1.01 (the closer to 1.00, the better sensitivity). For Infit and Outfit ZSTD, the average value of table person is -0.2 and -0.1. The ideal

value is 0.0. If it gets closer to the value of 0.0 then the quality gets better and so does the table item. The grouping of persons and items can be seen from the separation value. The greater the value of separation, the good the quality of the instrument in terms of overall respondents because it can identify response and items groups. The value of separation items is 6.68, then the grouping or H is 9, 24 and rounded to 9. The number 9 shows there are nine groups of items. While the value of person separation is 0.19, the grouping or H is 0.6. If the H value is less than 2, the grouping of people is said to be bad. In summary, the overall analysis shows that students' responses are not consistent even though the items have demonstrated their reliability.

CONCLUSION

Environmental education addresses the challenge to growth their student attitude toward the environment and its problem. Environmental attitude affects the individual behavior toward the environment. However, the positive tendency is not always followed by the real action of green behavior such as reduce, reuse, recycle and replace. Preservice teacher has to contribute in saving the planets through their learning activity. Consequently, their experience rich the knowledge of environmental issues and expand the ideas for innovative solution. The profile of environmental attitude is the basic information for teacher or lecturer to develop the instructional strategy in order to build the generation that literate to the environment. The inconsistency responds of preservice biology teacher based on the research need to be followed by rearrange the curriculum that integrates the social and ecological issues. Furthermore, learning activity stimulates the prior knowledge of preservice teacher and force them to generates the ideas to solve the problem related to the issues.

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